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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/978,308	10/17/2001	Mikihide Nakamaru	086531-0130	4330

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EXAMINER

PALABRICA, RICARDO J

ART UNIT PAPER NUMBER

3641

DATE MAILED: 06/10/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/978,308

Applicant(s)

NAKAMARU ET AL.

Examiner

Rick Palabrica

Art Unit

3641

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 April 2003.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-3, 6, 7 and 11-16 is/are pending in the application.
- 4a) Of the above claim(s) 3, 7 and 11-14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 6, 15 and 16 is/are rejected.
- 7) ☒ Claim(s) 1 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

1. Applicant's amendment in Paper No. 15, which amends claims 1 and 6, cancels claims 4, 5 and 8-10, and adds new claims 15 and 16, is acknowledged. This amendment is in response to the 1/17/03 Office Action.

2. The 10/17/2001 preliminary amendment, which amended claim 13 and added new claim 14, is also acknowledged. Note that these claims are to a non-elected species, as per applicant's election in Paper No. 11. Also, the 2/28/02 substitute specification that corrects grammatical errors in the original specification is also acknowledged.

3. Applicant alleges that the amendment to claim 1 overcomes the 35 U.S.C. 112, second paragraph rejection in said Office Action. The examiner disagrees for the reasons cited in section 4 below.

Applicant also traversed the rejection of claims based on prior art cited in said Office Action. Applicant's arguments have been fully considered but found unconvincing, as discussed in section 7 below.

Claim Objections

4. Claims 1, 2, 6 and 15 are objected to because they are improper (see MPEP 706.01).

Applicant alleges in his remarks that the amendment to claim 1 clarifies that the claimed invention is directed to a reactor core. This amendment is in response to a 35 U.S.C. 112, 2nd paragraph rejection in the previous Office Action. The amendment does not resolve the indefiniteness of the claim because, as amended, the claim still recites the preamble as being directed to a subcombination of a reactor core, whereas the body recites a combination of a reactor core and pressure vessel.

Note that the preamble of amended claim 1 recites a "reactor core" whereas the body recites "a plurality of fuel assemblies which are supported by the core support plate and the upper grid." Underlining provided. The statement, "supported by" implies that "the core support plate and upper grid" are being claimed along with the fuel assemblies. As currently recited in the preamble, the core support plate and the upper grid are elements of the reactor pressure vessel and not of the reactor core.

Applicant may either: a) change the preamble to specifically recite the core support plate and upper grid to be part of the reactor core; or b) replace "supported by" with an alternative statement, e.g., "capable of being supported by", etc.

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim Rejections - 35 USC § 112

5. Claim 16 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claim 16 discloses a reactor core capable of continuous operation for at least 15 years in a reactor pressure vessel, said core comprising fuel rods arranged in square lattices at a certain pitch and having control rods with a specific range of B/S values. There is neither an adequate description nor enabling disclosure as to how and in what manner said fuel and control rod attributes alone would assure at least 15 years continuous operation. There are many other factors that determine how long a core can be operated without refueling, e.g., power generation mode (e.g., continuous base load operation at full power, load-following scheme, etc), how the control rods are operated (e.g., fully withdrawn, partially withdrawn, combination of the latter two modes, etc.), integrity of fuel assemblies (e.g., presence or absence of any fuel leakers), etc.

6. Claim 16 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 16 is vague, incomplete and misdescriptive for the reasons cited in section 5 above.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1, 2 and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by any one of Gassmann (U.S. 5,677,938), or Fredin et al. (U.S. 3,929,565) or Crowther (U.S. 3,147,191). Any one of these references discloses a reactor core comprising a core support plate, upper grid, a plurality of fuel assemblies and a plurality of cross-sectional cruciform control rods each having four blades that are inserted into four adjacent spaces formed by four fuel assemblies facing each other.

Any one of these references also shows a reactor core wherein the B/S ratio is 0.06 cm^{-1} or greater. See Fig. 3 in Gassmann, or Fig. 8 in Fredin et al., or Fig. 2 in Crowther. Note that this B/S ratio is a relationship between blade width and pitch of the fuel assemblies. While patent drawings are not drawn to scale, relationships clearly shown in the drawings of a reference patent cannot be disregarded in determining the patentability of the claims. See *In re Mraz*, 59 CCPA 866, 455 F.2d 1069, 173 USPQ 25 (1972). See discussion below on how the B/S ratios were obtained by measurements.

The claims contain functional phrases or clauses such as “being adapted for insertion into a space between four square lattices of fuel rods”, “being adapted for insertion into four adjacent spaces between four fuel assemblies facing each other”, etc. that are essentially method limitations or statements of intended use or field of use.

These clauses, as well as other statements of intended use do not serve to patently distinguish the claimed structure over that of the reference. See In re Pearson, 181 USPQ 641; In re Yanush, 177 USPQ 705; In re Finsterwalder, 168 USPQ 530; In re Casey, 152 USPQ 235; In re Otto, 136 USPQ 458; Ex parte Masham, 2 USPQ 2nd 1647.

See also MPEP 2114 that states:

A claim containing a "recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus" if the prior art apparatus teaches all the structural limitations of the claim. Ex parte Masham, 2 USPQ2d 1647.

Claims directed to apparatus must be distinguished from the prior art in terms of structure rather than function. In re Danly, 263 F.2d 844, 847, 120 USPQ 528, 531.

Apparatus claims cover what a device is, not what a device does."
Hewlett-Packard Co. v. Bausch & Lomb Inc., 15 USPQ2d 1525, 1528.

As set forth in MPEP 2115, a recitation in a claim to the material or article worked upon does not serve to limit an apparatus claim.

In any case, any one of the devices cited in the above references is capable of being used in the same manner as the claimed invention.

In Paper No. 15, applicant traversed the rejection of the claims on the grounds that none of the references teach a reactor core design that is capable of operating for 15 years or longer without refueling. The examiner disagrees because the feature upon which the applicant relies is a statement of intended or desired use. The claims are to an apparatus and, as stated above, the feature cited by the applicant does not serve to patently distinguish the claimed invention over that of the reference. In any case, since the apparatus in the cited references anticipate the claims, any one of them is inherently

capable of operating in the same manner and for the same intended use as the claimed invention.

Applicant also alleges that if the drawings are not to scale, a B/S ratio cannot be extracted from them. The examiner disagrees. The applicant himself cites MPEP 2125 which states that drawings and pictures can anticipate claims if they clearly show the structure which is claimed. This is the case with the figures in the prior art references. They clearly show the claimed structural features of fuel assemblies and plurality of control rods having a cruciform cross section and a B/S ratio within the claimed range.

Applicant also alleges that the cited references do not show details of the control rods in sufficient "particularity" to permit an easy measurement of the illustrated ratio. The examiner disagrees because the examiner was able to make easy measurements from the cited figures using a ruler. Measurements of the blade width (B) and the pitch of the fuel assemblies (A) formed the basis for the examiner's conclusion that the (B/S) ratios are within the claimed range.

Applicant further alleges that his own "rough calculations" based upon the drawings show B/S ratios less than the claimed range. The examiner doubts the value of these calculations. Rough calculations are synonymous to "eyeball" estimates that are inaccurate and unreliable. They can be used to prove anything that an individual making the calculation wants to show. Measurement-based data would confirm the conclusions of the examiner.

Applicant also states that figures should not be interpreted or extrapolated in view of the teachings of the applicant's specification. The examiner neither needed nor

utilized the applicant's specification to arrive at the approach to prove his case. His arguments were based on actual measurements of well-known embodiments disclosed in prior art. Of course, after the values from these measurements were obtained, they were compared with those specified by the applicant in his disclosure. This comparison is neither an interpretation nor extrapolation of the specification.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over either one of Gassmann or Crowther, as applied to claims 1, 2 and 16 above, and further in view of the combination of Abate-Daga et al. (U.S. 3,917,768) and Alsop (U.S. 4,671,927). Either one of Gassmann or Crowther discloses the applicant's claims except for the grain size and weight percentage of gadolinium oxide.

Abate-Daga et al. disclose a method of preparing a sintered nuclear fuel containing a consumable poison such as gadolinium oxide having 10 to 2000 microns diameter and uniformly distributed within the fuel (see column 1, lines 48+). They teach that uniform distribution can be achieved with gadolinium oxide having grain sizes in said range, and a uniform distribution allows the poison to be consumed at the same rate as the fuel (see column 1, lines 11+).

Alsop discloses a nuclear fuel rod containing pellets having 1 to 20 per by weight gadolinium oxide. Alsop teaches that incorporation of gadolinium oxide as a burnable absorber into a fissionable material, which is a well-known practice in the industry (see column 3, lines 65+). They also teach that gadolinium oxide provides for compensation for reduction in reactivity due to the consumption of fissionable material, and such compensation is achievable within said wt % range (see column 1, lines 35+ and column 2, lines 62+).

One having ordinary skill in the art would have recognized that the references cited above pertain to the same field of endeavor, and the teachings of Alsop and Abate-Daga et al. would apply to the primary references.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of any one of Gassmann or Crowther, by the teachings of the combination of Abate-Daga et al., and Alsop to have a gadolinium oxide uniformly dispersed as burnable poison in the nuclear fuel, said poison having a particle grain size between 50 microns and 200 microns and 15 wt % or greater, to gain the advantages thereof, because such modification is no more than the use of conventional designs/techniques within the nuclear art and well-known grain sizes, particle distribution mode and weight percentages in the nuclear pellet art.

9. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over either one of the combination of Gassmann with Abate-Daga et al., and Alsop or the combination of Crowther with Abate-Daga et al., and Alsop, as applied to claim 15 above, and further in view of Hida et al. (U.S. 5,524,033). Either one of the combination of

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Gassmann with Abate-Daga et al., and Alsop or the combination of Crowther with Abate-Daga et al., and Alsop disclose the applicant's claim except for the specific enrichment of the gadolinium isotopes with odd mass numbers in the burnable poison.

Hida et al. teach a nuclear fuel containing gadolinium as burnable poison (see Abstract and Fig. 1). Their nuclear fuel exhibits increased fuel burn up efficiency by increasing reactivity while minimizing any adverse effect on the shutdown and thermal margins (see column 1, lines 9+). They disclose embodiments as shown in Table 4 and Table 5 wherein the combined enrichment of gadolinium isotopes with odd mass numbers is greater than the corresponding combined enrichment in natural gadolinium. One having ordinary skill in the art would have recognized that these references pertain to the same field of endeavor, and the teaching of Hida et al. would apply to any one of the primary references.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the apparatus, as disclosed by either one of the combination of Gassmann with Abate-Daga et al., and Alsop or the combination of Crowther with Abate-Daga et al., and Alsop, by the teaching of Hida et al., to have a nuclear fuel with burnable gadolinium poison, wherein the combined enrichment of gadolinium isotopes with odd mass numbers is greater than the corresponding combined enrichment in natural gadolinium, to gain the advantages thereof (i.e., increased fuel burn up efficiency), because such modification is no more than the use of conventional designs/techniques within the nuclear art, and the use of well-known enrichment of such gadolinium isotopes.

Conclusion

10. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rick Palabrica whose telephone number is 703-306-5756. The examiner can normally be reached on 7:00-4:30, Mon-Fri; 1st Friday off.

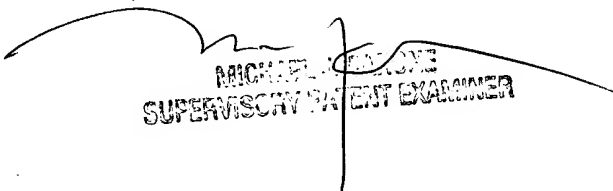
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Carone can be reached on 703-306-4198. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-7687 for regular communications and 703-305-7687 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-1113.

RJP
June 9, 2003


MICHAEL J. MALONE
SUPERVISORY PATENT EXAMINER